

NON-PUBLIC?: N
ACCESSION #: 9010260117

LICENSEE EVENT REPORT (LER)

FACILITY NAME: COMANCHE PEAK - UNIT 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000445

TITLE: REACTOR TRIP RESULTING FROM IMPROPER ROUTING OF HEATER
DRAIN PUMP

CABLE SHIELD GROUND LEAD

EVENT DATE: 09/15/90 LER #: 90-030-00 REPORT DATE: 10/15/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 054

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: G.P. McGEE SUPERVISOR, COMPLIANCE TELEPHONE: (817) 897-8477

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 15, 1990, Comanche Peak Steam Electric Station Unit 1 was in Mode 1, Power Operation, with reactor power at 54 percent. Operations personnel were preparing to raise reactor power to support secondary system performance evaluation and tuning. When a second Condensate pump was started, the operating Heater Drain Pump and Main Feedwater Pump tripped. As a result of decreasing Steam Generator levels, a manual reactor trip was initiated. The cause of the event was an improperly routed Heater Drain Pump shield ground lead which caused a false ground overcurrent signal. Corrective action included rework of the affected component and review of similar components for the same problem.

END OF ABSTRACT

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I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

An event or condition that resulted in the manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

B. PLANT OPERATING CONDITIONS BEFORE THE EVENT

On September 15, 1990, just prior to the event, Comanche Peak Steam Electric Station (CPSES) Unit 1 was in Mode 1, Power Operation, with reactor power at 54 percent.

C. STATUS OF STRUCTURES, SYSTEMS, OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

There were no inoperable structures, systems or components that contributed to the event.

D. NARRATIVE SUMMARY OF THE EVENT INCLUDING DATES AND APPROXIMATE TIMES

On September 15, 1990, at 2048 CDT, operating personnel were preparing to increase reactor (EIIS:(AB)(RCT)) power from 54 percent to 60 percent to support continued secondary system performance evaluation and tuning. Main Feedwater Pump 1A (EIIS:(SJ)(P)), Condensate Pump 1-02 (EIIS:(SD)(P)), and Heater Drain Pump 1-01 (EIIS:(SM)(P)) were in service. Operation with a single Condensate Pump differed from previous plant operating practice which was to have both condensate pumps running prior to starting a heater drain pump. The difference in operating configuration was due to the secondary system tuning in progress.

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At approximately 2048 the Balance of Plant Reactor Operator (utility, licensed) started Condensate Pump 1-01. Heater Drain Pump 1-01 and Main Feedwater Pump 1A tripped immediately in quick succession. Control Room alarms (EIIS:(IB)(ANN)) indicated a ground fault on Heater Drain Pump 1-01. Main

Feedwater Pump 1A tripped on low suction pressure caused by the loss of Heater Drain Pump flow. The Reactor Operator immediately started Main Feedwater Pump 1B, but the pump did not come up to speed quickly enough to control steam generator level (EIS:(SG)(SB)), and a manual reactor trip was ordered prior to reaching the Steam Generator Lo-Lo level reactor trip setpoint. At 2052 the reactor was manually tripped, and operating personnel responded in accordance with emergency operating procedures stabilizing the plant in Mode 3.

E. THE METHOD OF DISCOVERY OF EACH COMPONENT OR SYSTEM FAILURE OR PROCEDURAL OR PERSONNEL ERROR

Troubleshooting activities were initiated to identify the cause of the ground fault on Heater Drain Pump 1-01. Initial inspection of the power cables (EIS:(CBL5)(SN)) and pump motor (EIS:(SN)(MO)) did not reveal the site of the ground. The plant secondary systems were realigned to the configuration existing prior to the event and Condensate Pump 1-01 was restarted. Heater Drain Pump 1-01 again tripped, and maintenance personnel (utility, non-licensed) detected current on the ground sensor current transformer (EIS:(FC)(XCT)). Inspection of the grounding sensor current transformer revealed that the metal power cable shields were improperly grounded in the switch-gear enclosure (EIS:(EA)(CAB)). Cable shields routed through the ground sensor current transformer must be grounded only after being returned through the current transformer to cancel out the magnetic field introduced due to circulating currents within the cable shields. The shield ground lead was run directly from the cable termination to a ground point in the switchgear without passing through the current transformer.

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II. COMPONENT OR SYSTEM FAILURES

A. FAILED COMPONENT INFORMATION

Not applicable - there were no component failures associated with this event.

B. FAILURE MODE, MECHANISM AND EFFECT OF EACH FAILED COMPONENT

Not applicable - there were no component failures associated with this event.

C. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE

Not applicable - there were no component failures associated with this event.

D. SYSTEMS OR SECONDARY FUNCTIONS THAT WERE AFFECTED BY FAILURE OF COMPONENTS WITH MULTIPLE FUNCTIONS

Not applicable - there were no component failures associated with this event.

III. ANALYSIS OF THE EVENT

A. SAFETY SYSTEM RESPONSES THAT OCCURRED

The Reactor Protection System (EHS:(JC)) and Auxiliary Feedwater System (EHS:(BA)) actuated during the event; all associated components within these systems functioned as designed.

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B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

Not applicable - there were no safety systems which were rendered inoperable due to or during this event.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

A loss of normal feedwater resulting from pump failure, valve malfunction, or loss of offsite power leads to a reduction in the capability of the secondary system to remove heat generated in the reactor core. These events are analyzed in section 15.2.7 of the CPSES Final Safety Analysis Report (FSAR) which uses conservative assumptions in the analysis to minimize the energy removal capability of the Auxiliary Feedwater System. The reactor trip on September 15, 1990, occurred at 54 percent reactor power, and all systems and components functioned as designed. The event is completely bounded by the FSAR accident analysis which assumes an initial power level of 102 percent and the worst single failure in the Auxiliary Feedwater System. It is concluded that the event of September 15 did not

adversely affect the safe operation of CPSES Unit 1 or the health and safety of the public.

IV. CAUSE OF THE EVENT

IMMEDIATE CAUSE

The immediate cause of the manually actuated reactor trip was loss of Main Feedwater flow leading to a decrease in Steam Generator levels. Feedwater flow was lost when Main Feedwater Pump 1A tripped on low suction pressure following the trip of Heater Drain Pump 1-01. The ground overcurrent relay associated with Heater Drain Pump 1-01 sensed a false overcurrent condition when Condensate Pump 1-01 was started.

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Non-safety related, 6.9 KV switchgear utilizes metal shielded cable from the switchgear enclosure to the load. The applicable electrical specification requires that shielding which is terminated and grounded after the cable passes through a ground sensor current transformer have the shield ground lead carried back through the ground sensor current transformer before grounding. Routing the shield ground lead back through the current transformer cancels the magnetic field induced by circulating currents present in metal shielded cables.

The braided wire providing the ground for Heater Drain Pump 1-01 cable shields was not returned through the ground sensor current transformer. Induced current in one or more cable shields was caused by the inrush current of adjacent power cables associated with Condensate Pump 1-01. These power cables are installed in the same cable tray with power cables for Heater Drain Pump 1-01. The cable shield induction caused circulating currents which were detected as a false ground. The ground sensor current relay is set for an instantaneous relay pickup at 1 amp. The ground fault protection is intended for personnel and equipment safety in the event of a system ground fault. Testing performed under conditions similar to those existing during the event resulted in ground fault relay currents in excess of 1 amp.

ROOT CAUSE

The root cause of the event is equipment installation error which resulted in the shield ground lead not being installed per design following rework on Train C (non-safety related) switchgear

foundations. The cables for Heater Drain Pump 1 -01 were determined during the Train C switchgear leveling effort in the 4th quarter of 1987. Work orders reviewed do not contain details on routing of wiring during reinstallation of the switchgear. Testing requirements would not show the shield ground lead routing error unless the Heater Drain Pump 1-01 ground fault relay current was being monitored at the same time that Condensate Pump 1-01 was being started. No other work orders, construction activity or testing was found to have been performed on this switchgear subsequent to the rework effort.

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V. CORRECTIVE ACTIONS

The following corrective actions were performed to restore the affected component to the configuration required by design specification and to address the potential generic considerations of the as-found condition.

1. The shield ground lead for Heater Drain Pump 1-01 was rerouted in accordance with the applicable engineering specification, and satisfactory testing was performed under conditions similar to those resulting in the event.
2. All other non-safety related 6.9 KV switchgear were inspected for improperly routed shield ground leads. None were found.
3. Safety related 6.9 KV switchgear design was reviewed to verify that susceptibility to this problem does not exist. 480V switchgear does not utilize metal shielded cable and is not susceptible to the condition leading to this event.
4. The applicable maintenance procedure will be revised to include verification of correct routing of shield ground leads during installation and termination of medium voltage power cables.

VI. PREVIOUS SIMILAR EVENTS

There have been no previous reactor trips attributable to the causes identified during the event investigation.

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Log # TXX-90348
File # 10200

910.4

Ref. # 50.73 (a)(2)(iv)

TUELECTRIC

William J. Cahill, Jr. October 15, 1990
Executive Vice President

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NO. 50-445
MANUAL OR AUTOMATIC ACTUATION OF ANY ENGINEERED SAFETY
FEATURE
LICENSEE EVENT REPORT 90-030-00

Gentlemen:

Enclosed is Licensee Event Report 90-030-00 for Comanche Peak Steam
Electric Station Unit 1, "Reactor Trip Resulting From Improper Routing of
Heater Drain Pump Ground Cable."

Sincerely,

William J. Cahill, Jr.

H. D. Bruner
Senior Vice President

KWV/daj

Enclosure

c - Mr. R. D. Martin, Region IV
Resident Inspectors, CPSES (3)

400 North Olive Street L.B. 81 Dallas, Texas 75201

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